ARCHIVE

for

RATIONAL MECHANICS

and

ANALYSIS

Edited by

C. TRUESDELL & J. SERRIN

Volume 44

SPRINGER-VERLAG
BERLIN · HEIDELBERG · NEW YORK
1971/72

With the acceptance of a manuscript for publication, the publishers acquire the sole copyright for all languages and countries, including all rights of photocopying or reproduction by any other method, even in microform.

Alle Rechte, einschließlich das der Übersetzung in fremde Sprachen und das der photomechanischen Wiedergabe oder einer sonstigen Vervielfältigung, auch in Mikroform, vorbehalten. Jedoch wird gewerblichen Unternehmen für den innerbetrieblichen Gebrauch nach Maßgabe des zwischen dem Börsenverein des Deutschen Buchhandels e.V. und dem Bundesverband der Deutschen Industrie abgeschlossenen Rahmenabkommens die Anfertigung einer photomechanischen Vervielfältigung gestattet. Wenn für diese Zeitschrift kein Pauschalabkommen mit dem Verlag vereinbart worden ist, ist eine Wertmarke im Betrage von DM 0,40 pro Seite zu verwenden. *Der Verlag läßt diese Beträge den Autorenverbänden zufließen.*

Springer-Verlag Berlin · Heidelberg · New York
Printer: Universitätsdruckerei H. Stürtz AG, Würzburg
Printed in Germany — © by Springer-Verlag Berlin Heidelberg 1971/72

EDITORIAL BOARD

S. AGMON
The Hebrew University
Jerusalem

R. ARIS
University of Minnesota
Minneapolis

L. CESARI
University of Michigan
Ann Arbor

B. D. COLEMAN
Mellon Institute of Science
Pittsburgh, Pennsylvania

L. COLLATZ
Institut für Angewandte Mathematik
Universität Hamburg

A. ERDÉLYI
Mathematical Institute
The University of Edinburgh

J. L. ERICKSEN
The Johns Hopkins University
Baltimore, Maryland

G. FICHERA
Istituto Matematico
Università di Roma

H. GÖRTLER
Institut für Angewandte Mathematik
Universität Freiburg i. Br.

A. E. GREEN
Mathematical Institute
University of Oxford

M. E. GURTIN
Carnegie-Mellon University
Pittsburgh, Pennsylvania

D. D. JOSEPH
University of Minnesota
Minneapolis

M. KAC
Rockefeller University
New York 21, New York

C. C. LIN
Massachusetts Institute of Technology
Cambridge, Massachusetts

J. L. LIONS
Département de Mathématiques
Université de Paris

J. C. C. NITSCHE
University of Minnesota
Minneapolis

W. NOLL
Carnegie-Mellon University
Pittsburgh, Pennsylvania

R. S. RIVLIN
Lehigh University
Bethlehem, Pennsylvania

M. M. SCHIFFER
Stanford University
California

J. SERRIN
University of Minnesota
Minneapolis

E. STERNBERG
California Institute of Technology
Pasadena, California

R. A. TOUPIN
Watson Research Center
Yorktown Heights, New York

C. TRUESDELL
The Johns Hopkins University
Baltimore, Maryland

C.-C. WANG
Rice University
Houston, Texas

Mechanicam vero duplicem Veteres constituerunt: Rationalem *quae per Demonstrationes accurate procedit, & Practicam. Ad practicam spectant Artes omnes Manuales, a quibus utique* Mechanica *nomen mutuata est. Cum autem Artifices parum accurate operari soleant, fit ut* Mechanica *omnis a* Geometria *ita distinguatur, ut quicquid accuratum sit ad* Geometriam *referatur, quicquid minus accuratum ad* Mechanicam. *Attamen errores non sunt Artis sed Artificum. Qui minus accurate operatur, imperfectior est Mechanicus, & si quis accuratissime operari posset, hic foret Mechanicus omnium perfectissimus.* NEWTON

La généralité que j'embrasse, au lieu d'ébloutr nos lumieres, nous découvrira plutôt les véritables loix de la Nature dans tout leur éclat, & on y trouvera des raisons encore plus fortes, d'en admirer la beauté & la simplicité. EULER

... ut proinde his paucis consideratis tota haec materia redacta sit ad puram Geometriam, quod in physicis & mechanicis unice desideratum. LEIBNIZ

The ARCHIVE FOR RATIONAL MECHANICS AND ANALYSIS nourishes the discipline of mechanics as a deductive, mathematical science in the classical tradition and promotes pure analysis, particularly in contexts of application. Its purpose is to give rapid and full publication to researches of exceptional moment, depth, and permanence.

Each memoir must meet a standard of rigor set by the best work in its field. Contributions must consist largely of original research; on occasion, an expository paper may be invited.

English, French, German, Italian, and Latin are the languages of the Archive. Authors are urged to write clearly and well, avoiding an excessively condensed or crabbed style. The editors reserve the right to return to authors manuscripts found deficient in style, form, or clarity.

Manuscripts intended for the Archive should be submitted to an appropriate member of the Editorial Board.

CONTENTS OF VOLUME 44

AMANN, H., A Uniqueness Theorem for Nonlinear Elliptic Boundary Value Problems 178

BAILEY, P. B., & P. J. CHEN, On the Local and Global Behavior of Acceleration Waves: Addendum, Asymptotic Behavior 212

BHATTACHARYYA, S. P., & P. C. JAIN, Hydrodynamic Stability in the Presence of a Magnetic Field 281

BUTZER, P. L., W. KOLBE, & R. J. NESSEL, Approximation by Functions Harmonic in a Strip 329

CHADWICK, P., & R. W. OGDEN, On the Definition of Elastic Moduli 41

——, A Theorem of Tensor Calculus and its Application to Isotropic Elasticity 54

CHEN, P. J., see BAILEY, P. B. 212

COWIN, S. C., see GOODMAN, M. A. 249

DE GRAAF, J., Propagative Linear Dynamical Systems 157

——, Some Theorems on Holomorphic Matrices 337

DE TEMPLE, D. W., Generalizations of the Grunsky-Nehari Inequalities . . . 93

EDELEN, D. G. B., Theories with an Additive Gauge Group 359

GOEL, R. M., On Radii of Starlikeness, Convexity, Close-to-Convexity for p-Valent Functions 320

GOODMAN, M. A., & S. C. COWIN, A Continuum Theory for Granular Materials 249

GURTIN, M. E., Time-Reversal and Symmetry in the Thermodynamics of Materials with Memory 387

HOFMANN, W., Konvergenzsätze für Regula-falsi-Verfahren 296

HUNG, W., see JOSEPH, D. D. 1

JAIN, P. C., see BHATTACHARYYA, S. P. 281

JOSEPH, D. D., & W. HUNG, Contributions to the Nonlinear Theory of Stability of Viscous Flow in Pipes and Between Rotating Cylinders 1

KNAPP, R. H., & RUTHERFORD ARIS, On the Equations for the Movement and Deformation of a Reaction Front 165

KNOWLES, J. K., & E. STERNBERG, On a Class of Conservation Laws in Linearized and Finite Elastostatics 187

KOLBE, W., see BUTZER, P. L., et al. 329

McLaughlin, R., Extremal Problems for a Class of Symmetric Functions 310

Meixner, J., Symmetric Systems of Orthogonal Polynomials 69

Moses, H.E., & A.F. Quesada, The Expansion of Physical Quantities in Terms of the Irreducible Representations of the Scale-Euclidean Group and Applications to the Construction of Scale-Invariant Correlation Functions. Part I. Concepts. One-Dimensional Problems 217

Nessel, R.J., see Butzer, P.L., et al. 329

Ogden, R.W., see Chadwick, P. 41, 54

Quesada, A.F., see Moses, H.E. 217

Raats, P.A.C., The Role of Inertia in the Hydrodynamics of Porous Media 267

Rutherford Aris, see Knapp, R.H. 165

Schiffer, M., & G. Schober, An Extremal Problem for the Fredholm Eigenvalues 83

Schober, G., see Schiffer, M. 83

Sellers, P.H., An Introduction to a Mathematical Theory of Chemical Reaction Networks I 23

——, An Introduction to a Mathematical Theory of Chemical Reaction Networks. II 376

Serrin, J., A Remark on the Preceding Paper of Amann 182

Sternberg, E., see Knowles, J.K. 187

Temam, R., Solutions Généralisées de Certaines Équations du Type Hypersurfaces Minima 121

Wetterling, W., Einschließung von Eigenelementen 76

EDITORIAL BOARD

S. AGMON
The Hebrew University
Jerusalem

R. ARIS
University of Minnesota
Minneapolis

L. CESARI
University of Michigan
Ann Arbor

B. D. COLEMAN
Mellon Institute of Science
Pittsburgh, Pennsylvania

L. COLLATZ
Institut für Angewandte Mathematik
Universität Hamburg

A. ERDÉLYI
Mathematical Institute
The University of Edinburgh

J. L. ERICKSEN
The Johns Hopkins University
Baltimore, Maryland

G. FICHERA
Istituto Matematico
Università di Roma

H. GÖRTLER
Institut für Angewandte Mathematik
Universität Freiburg i. Br.

A. E. GREEN
Mathematical Institute
University of Oxford

M. E. GURTIN
Carnegie-Mellon University
Pittsburgh, Pennsylvania

D. D. JOSEPH
University of Minnesota
Minneapolis

M. KAC
Rockefeller University
New York 21, New York

C. C. LIN
Massachusetts Institute of Technology
Cambridge, Massachusetts

J. L. LIONS
Département de Mathématiques
Université de Paris

J. C. C. NITSCHE
University of Minnesota
Minneapolis

W. NOLL
Carnegie-Mellon University
Pittsburgh, Pennsylvania

R. S. RIVLIN
Lehigh University
Bethlehem, Pennsylvania

M. M. SCHIFFER
Stanford University
California

J. SERRIN
University of Minnesota
Minneapolis

E. STERNBERG
California Institute of Technology
Pasadena, California

R. A. TOUPIN
Watson Research Center
Yorktown Heights, New York

C. TRUESDELL
The Johns Hopkins University
Baltimore, Maryland

C.-C. WANG
Rice University
Houston, Texas

CONTENTS

BUTZER, P. L., W. KOLBE, & R. J. NESSEL, Approximation by Functions Harmonic in a Strip 329

DE GRAAF, J., Some Theorems on Holomorphic Matrices 337

EDELEN, D. G. B., Theories with an Additive Gauge Group . . . 359

SELLERS, P. H., An Introduction to a Mathematical Theory of Chemical Reaction Networks. II 376

GURTIN, M. E., Time-Reversal and Symmetry in the Thermodynamics of Materials with Memory 387

Printers: Universitätsdruckerei H. Stürtz AG, Würzburg
Printed in Germany — © by Springer-Verlag Berlin Heidelberg 1972